Excitation functions for production of ^{88}Zr and ^{88}Y by proton irradiation of Nb and Mo

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Yttrium-88 is produced in large scale for investigation of the biodistribution of ^{90}Y labeled therapeutic compounds, for gamma-ray detector calibration source and for dose determination in accelerator technology. Y-88 could be obtained by high energy spallation reaction on Mo and by medium energy reaction (up 100 MeV) on Mo and Nb. The ^{88}Y could be produced directly or via generator system from ^{88}Zr. No cross section data available practically for these medium energy reactions. The excitations functions of ^{nat}Mo(p,x)^{88}Zr,^{88}Y and ^{nat}Nb(p,x)^{88}Zr,^{88}Y were measured up to 70 MeV by using stacked foil irradiation technique and off-line gamma ray spectroscopy of the products. ^{nat}Al(p,x)^{22,24}Na and ^{nat}Cu(p,x)^{56,58}Co,^{62,65}Zn monitor reactions were to characterize the beam intensity and the energy degradation. Model calculations were done by using the Alice IPPE code to compare with the experimental values and to extrapolate the production cross sections up to 100 MeV. The model calculations reproduce well the experimental data. Integral yields of ^{88}Zr and ^{88}Y radioisotopes as a function of bombarding energy were calculated by using the experimentally measured excitation functions (up to 70 MeV) and by using the theoretical cross sections (normalized to the experimental data at the overlapping energy range). The expected thick target yields of ^{88}Zr and ^{88}Y for total degradation of 70 MeV protons on Nb target are 790 MBq/C and 120 MBq/C are respectively. The similar yield data of ^{88}Zr and ^{88}Y on Mo target are significantly lower: 1.55MBq/C and 0.2 MBq/C. On the basis of the yield data it can be concluded that from the point of view of the production yields the Nb+p route is much more efficient. The extension of the experimental data measurement up to 90 MeV is in progress.

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